Letters to the Editor: Comment and Reply

Marginal Production Technologies for Life Cycle Inventories

by Weidema, B.P.; Frees, N.; Nielsen, A.-M.
Int. J.LCA 4 (1) 48-56 (1999)

Comment

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Introduction

In the article "Marginal Production Technologies for Life Cycle Inventories" by Bo Weidema et al. [1] it is argued in favor of the use of marginal production technologies as a general principle for prospective LCA studies. Examples from the European electricity production and pulp and paper industry are used as case studies to back up the statement that this is a more valid approach in such situations than the traditional use of average data across an industry.

In the article reference is made to the aluminum industry argument that hydroelectricity is the dominant power source for primary aluminum production and questioning the validity of this for new production facilities. Further, there is also a reference to the use of this marginal principle for electricity production applied to a Danish LCA study of packaging systems for beer and soft drinks.

The use of the marginal production technology principle in this particular study leads to the original result of aluminum being produced in Denmark using electricity generated by coal, although no aluminum producer would even consider locating an aluminum smelter in Denmark under current framework conditions.

Factual Situation

This, in effect, shows the problem of using this principle for a global commodity. The marginal increase principle is well known from economic theory, but it is also well known that this has limitations in an open market and that one has to be careful about making sure that this principle is valid for the situation studied.

For a global commodity like aluminum, a small increase in use will not require the building of a dedicated new smelter to cover this increase. This will be covered by a combination of capacity creep at existing smelters, start up of idle capacity and the general capacity increase covered by the building of new smelters, all of which is required to account for the world-wide aluminum consumption increase of 2-3% per year spread out over a whole range of sectors and products.

The building of new smelters occurs all over the world. Typically, over the past 5 years, new smelters have been built or major capacity increases in Europe, North America, Africa, Australia and the Middle East. The sources of electricity supplying these smelters are hydroelectric, coal and surplus gas from oil fields. The IPAI statistical data (2), which has recorded energy sources for electricity used in primary aluminum plants since 1980, shows that the percentage of hydroelectricity used in 1990 was 55.6 and it was 55.9 in 1997 for Western World smelters. The production increase in this period has only changed the distribution between some of the fossil fuel energy carriers.

This shows that it is meaningless to try to link a production increase to one specific energy carrier.

There are two examples related to electric power production listed in the article: One example with reference to the hydropower used in the aluminum industry states that this will be produced and used anyway due to low production costs, irrespective of the aluminum production. The other example is from the European electricity production scenario. The examples listed overlook one simple point.

Hydroelectricity is mainly produced at locations far from the main population centers where general demand is high. Because of limitations in transfer networks, apart from in some areas of central Europe, it is impossible to transfer large amounts of electricity from Northern Norway or Siberia just by the flick of a switch.

The use of the marginal approach in general has not been encouraged because of the difficulty in portraying the realities of global commodities, such as aluminum, fairly. This because it is impossible to state that the specific production you are looking at will be supplied with metal from a specific new smelter with a defined energy source and raw material supply. Even when buying the metal from a specific supplier, this could come from a number of sources, all depending on the type of metal and quality required. It could also come from recycled metal even when it is supplied from a primary smelter.

Conclusion

In such a situation the only approach possible, even for a prospective LCA study, is to aggregate data from the possible sources of delivery and to use this as an input to the study. Weidema states in his article that actual average data is more difficult to collect than data for a marginal situation. But this is no argument against using average data when this is what most correctly portrays the actual situation. We would argue that this is also the only correct approach for a global commodity, since this will be the real situation for any new product. The material going into it will potentially be an average of the existing material on the market.

References

[1] Weidema, B.P.; Frees, N.; Nielsen, A.-M. (1999): Marginal Production Technologies for Life Cycle Inventories. Int. J. LCA 4 (1) 48-56

[2] IPAI Statistical Summary, International Primary Aluminum Institute, 1998